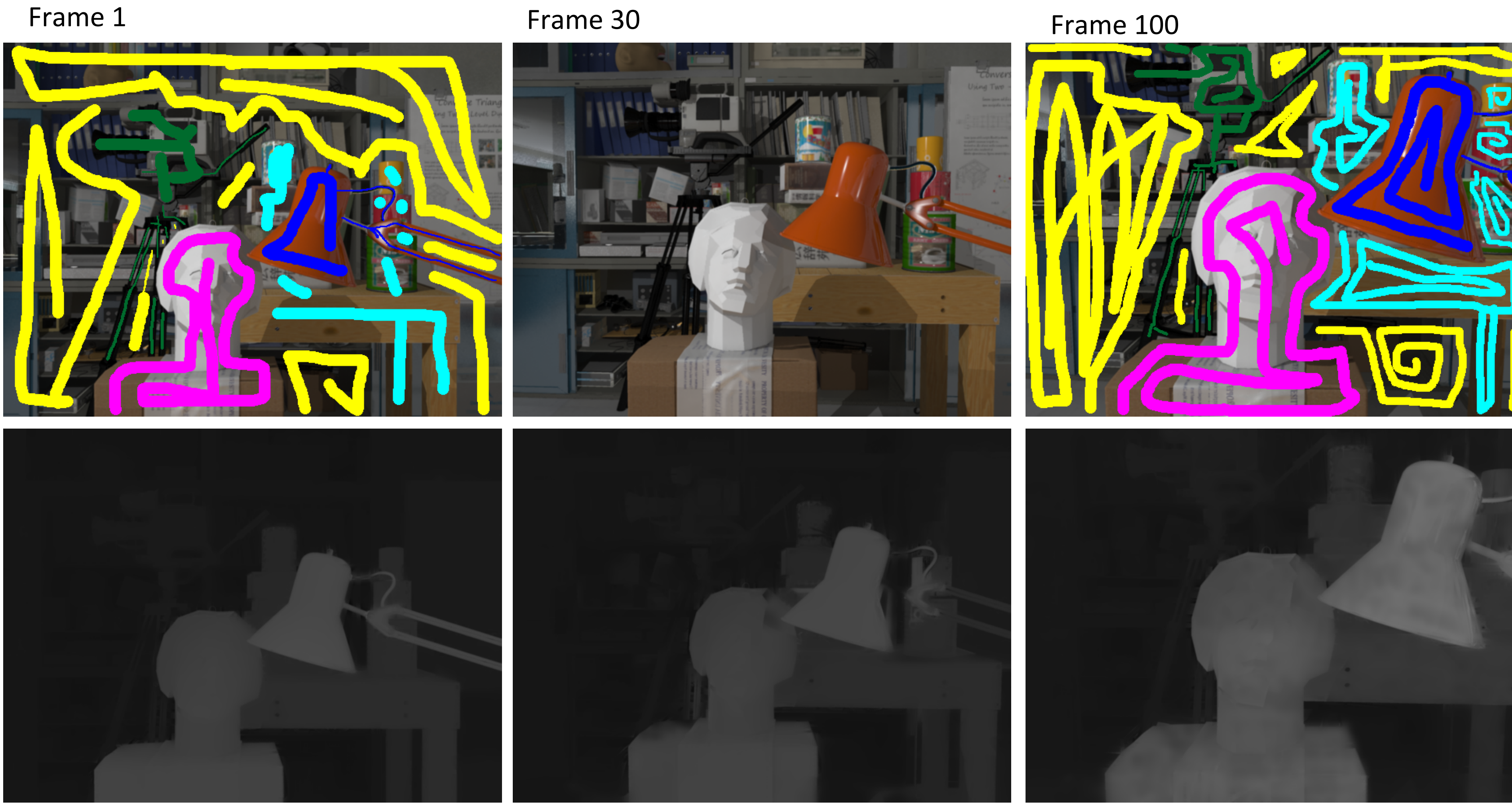
# Supplementary Material

## Efficient Depth Propagation in Videos with GPU-acceleration




**Example result of proposed 2D-to-3D conversion** (*Tsukuba1*).

**Top**: Input video and user input; The depth scribbles in frame 1 and frame 100 are color coded.

**Bottom**: 2D-to-3D conversion result.

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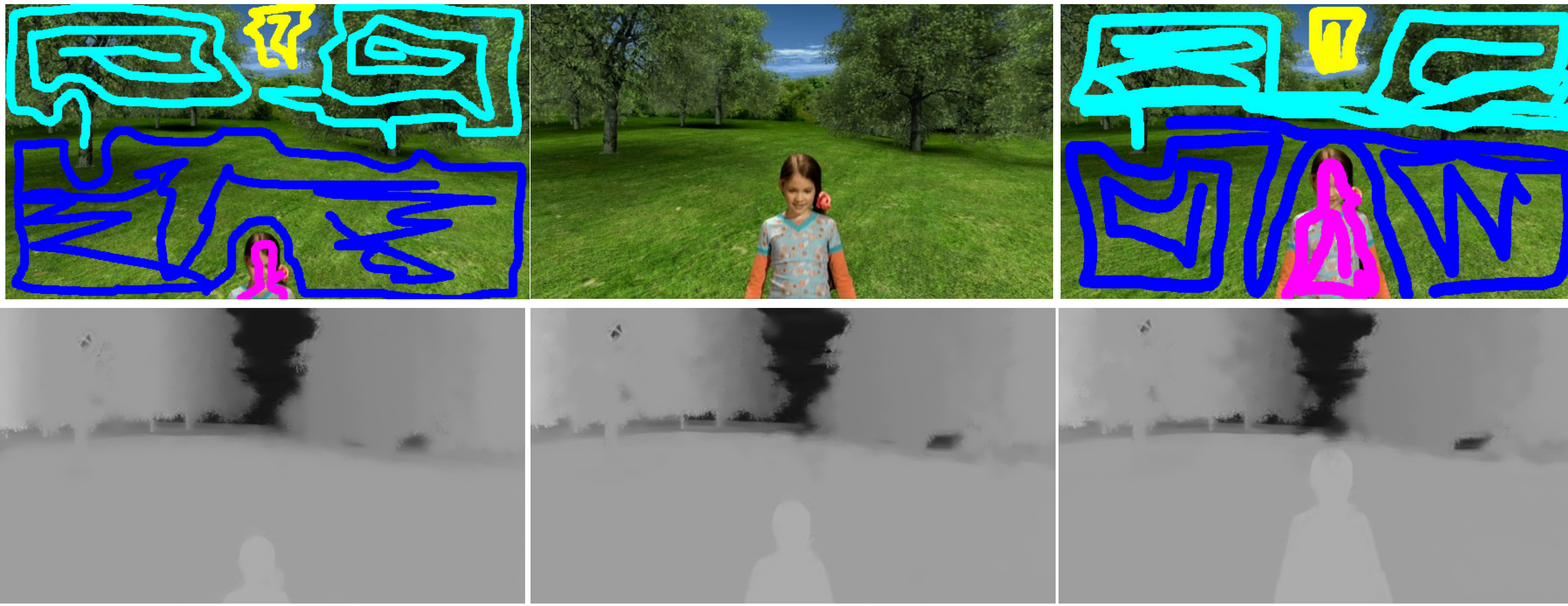


**Example result of proposed 2D-to-3D conversion** (*Child*).

**Top**: Input video and user input; The depth scribbles in frame 1 and frame 21 are color coded.

**Bottom**: 2D-to-3D conversion result.

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| **Video / MSE** | [1] with OF | [1] without OF | [4] | **Ours, with OF** | **Ours, without OF** |
|---|---|---|---|---|---|
| *Palace* | 1.01 | 1.39 | 8.51 | **0.17** | **0.17** |
| *Parade* | 0.23 | 0.23 | 6.87 | **0.12** | **0.13** |
| *City* | 0.32 | 0.56 | 10.30 | **0.08** | **0.09** |
| *Football* | 0.23 | 0.33 | 4.95 | **0.08** | **0.10** |
| *Stairs* | 0.19 | 0.31 | 1.56 | **0.12** | **0.12** |

**Quantitative evaluation and comparison to [1] and [4].**

*MSE*s (mean squared errors) are averaged over all frames and multiplied by 100. Results for [1] and [4] are taken from [1]. For this evaluation the same video, user-input and disparities as in [1] were used to generate resulting disparity maps. For the not optimized algorithm, i.e., [1], and our optimization the results for the algorithm with and without usage of optical flow (*OF*) are listed. All tested algorithms use the same method to estimate the used OF fields, which makes the evaluation independent of the quality of the performed motion estimation.

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| **Video / Runtime** | Resolution | Not optimized [1] (C++) | **Our optimization of [1]** (CUDA) |
|---|---|---|---|
| *City* | 699 x 232 x 19 | 440 | **12** |
| *Parade* | 689 x 282 x 11 | 286 | **7** |
| *Palace* | 702 x 278 x 10 | 267 | **7** |
| *Stairs* | 702 x 279 x 10 | 590 | **12** |
| *Football* | 669 x 282 x 20 | 974 | **27** |
| *Child* | 600 x 338 x 21 | 530 | **28** |
| *Tsukuba50* | 640 x 480 x 17 | 729 | **15** |
| *Tsukuba380* | 640 x 480 x 18 | 705 | **16** |

**Computational efficiency evaluation of the joint segmentation and propagation step in the un-optimized [1] and our optimized 2D-to-3D conversion algorithm.**
The table lists the runtimes in seconds. In this comparison, the joint segmentation and propagation step of the un-optimized and our optimized algorithm take the same input videos, user-input, disparities and parameters.

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| **Video / Runtime** | Video resolution | **Our optimized approach** (CUDA) | Approach from [1] (CUDA) |
|---|---|---|---|
| *City* | 699 x 232 x 19 | **0.62** | 1.36 |
| *Parade* | 689 x 282 x 11 | **0.14** | 0.36 |
| *Palace* | 702 x 278 x 10 | **0.13** | 0.34 |
| *Stairs* | 702 x 279 x 10 | **0.22** | 0.75 |
| *Football* | 669 x 282 x 20 | **0.44** | 1.70 |
| *Child* | 600 x 338 x 21 | **1.06** | 2.15 |
| *Tsukuba50* | 640 x 480 x 17 | **0.27** | 1.11 |
| *Tsukuba380* | 640 x 480 x 18 | **0.36** | 1.12 |

**Computational efficiency evaluation of region-wise filtering (i.e., regularization step) in the un-optimized [1] and our optimized 2D-to-3D conversion algorithm.**

The table lists the runtime in seconds. To emphasize the algorithmic contribution in this optimization, both region-wise filtering approaches were implemented in CUDA. In [1] each region is filtered in a separate filtering step. Contrary, our approach filters all regions separately but in a single filtering step. Both approaches applied on the same videos and number of regions.

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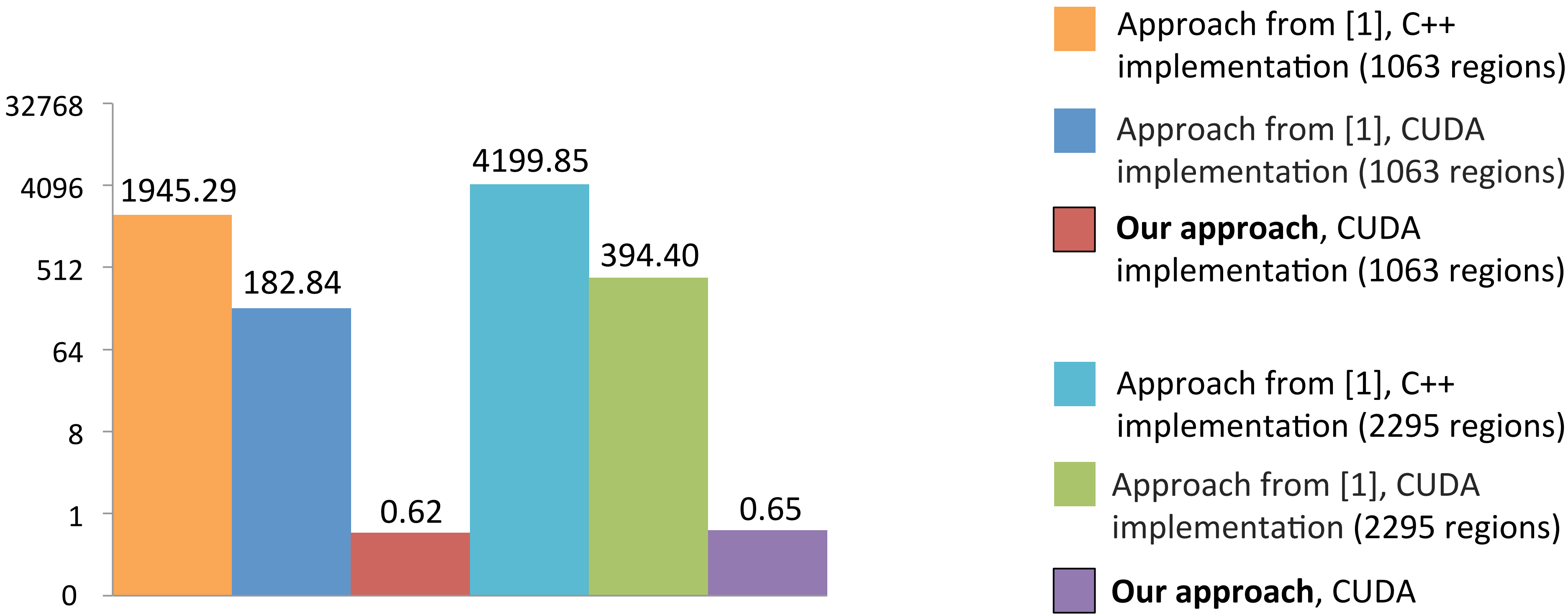


Runtime of different region-wise filter implementations in seconds.

**Computational efficiency evaluation of region-wise filtering (i.e., regularization step).**
Comparison of runtimes between the C++ and CUDA implementation of the initial region-wise filtering approach from [1] (i.e., each region is filtered in a separate filtering step) and our CUDA implementation of our region-wise filtering (i.e., all regions are separately filtered in one filtering step). The comparison is performed for a segmentation into 1063 and into 2295 regions. The chart lists the runtime of different implementations in seconds for a video with a resolution of 600 x 255 x 20 pixel.

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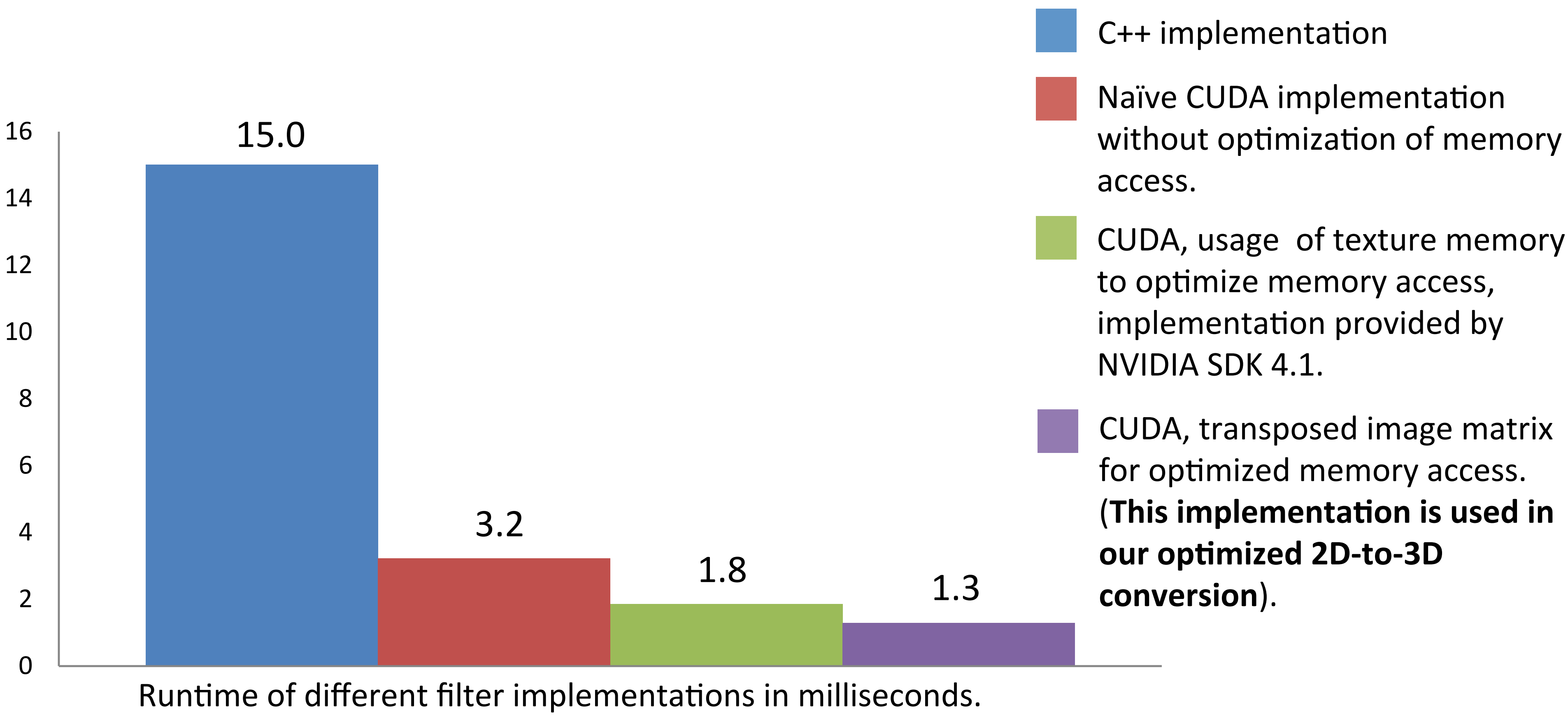


**Computational efficiency evaluation of different box filter implementations in CUDA, which is used in the regularization step (i.e., guided filtering) of the 2D-to-3D conversion algorithm.** The chart lists the runtime of different implementations in milliseconds for an image with a resolution of 1024 x 1024 pixel. Note that the guided filter, which is used in the interpolation step of the 2D-to-3D conversion algorithm, is implemented as a series of box filters. Thus, it is vital to efficiently implementation of a box filter to optimize the 2D-to-3D conversion algorithm from [1].